

**Action  
on WASTE**

**A Full Cost Analysis  
Guide  
for Municipal Waste Managers**

*September 1995*



**Alberta**  
ENVIRONMENTAL PROTECTION

## Acknowledgements

*A Full Cost Analysis Guide for Municipal Managers* is the first comprehensive guide of its kind to be prepared in Canada. Its development was prompted by the recommendations in *Our Forgotten Resource — The Common Sense Approach*, a report prepared by the Environment Council of Alberta Task Force on Economic Instruments for Waste Reduction and released in September 1994.

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## Contents

<b>Acknowledgements</b>	<b><i>i</i></b>
<b>Introduction</b>	<b>1</b>
Background	1
Purpose	3
Layout	4
<b>Section 1 – Full Cost Analysis...What Is It?</b>	<b>5</b>
<b>Section 2 – Full Cost Analysis...When and How to Use It</b>	<b>9</b>
The Phases of a Project	10
Full Cost Analysis Process	17
Cost Estimates	19
Considerations	25
Grouping and Summarization	28
Revenues and Benefits	30
Completion of the Process	32
<b>Section 3 – Full Cost Analysis...The Elements</b>	<b>33</b>
Risks	33
Monetary Costs Checklists	35
Considerations Checklists	41
Revenues Checklists	47
Benefits Checklists	48
<b>Section 4 – Full Cost Analysis...Handy Worksheets</b>	<b>51</b>
Cost Estimate Worksheet #1	53
Considerations Worksheet #2	55
Cost Categories (Monetary) Worksheet #3	57
Cost Group Summary Worksheet #4	59
Considerations Categories (Non-Monetary) Worksheet #5	61
Considerations Group Summary Worksheet #6	63
Revenues Worksheet #7	65
Benefits Summary Worksheet #8	67
Full Cost Summary Worksheet #9	69
<b>References</b>	<b>71</b>
<b>Figures</b>	
Figure 1: Full Cost Analysis Definition	6
Figure 2: Full Cost Analysis Process	18
Figure 3: Development of Cost Estimates	20
Figure 4: Considerations Ranking Factors	26

*Each year more than two million tonnes of waste must be collected, sorted and disposed of by Alberta's municipal waste management authorities. When all costs are considered, the annual bill for waste handling is estimated to be as high as half a billion dollars. Municipalities are looking for ways to reduce and offset these costs.*

***Our Forgotten Resource — The Common Sense Approach***

*The Environment Council of Alberta Task Force on Economic Instruments for Waste Reduction, September 1994*



## BACKGROUND

One of the most difficult problems currently facing Alberta's municipal governments is the management of the solid wastes produced by our society. Enhanced awareness of the need for environmental protection, public health protection and conservation of our resources has created a demand for new and innovative approaches to managing our wastes. At the same time, society is calling for all levels of government to hold the line on taxation and to reduce spending. Efforts to respond have been further complicated by the ever present NIMBY — Not In My Back Yard — syndrome that frustrates attempts to site new waste processing and disposal facilities which have been justified on the basis of optimum development and operating costs. Existing facilities are being closed as they reach capacity or as public pressure forces local decision-makers to cease operations considered environmentally or socially unacceptable.

In many areas, municipal governments are now facing an impending crisis with respect to waste disposal. In some, the lack of available facilities or monopolies on private facilities are causing the costs of responsible waste disposal to sky rocket. Often, municipal waste managers are left to their own limited resources and knowledge to resolve the dilemma, adopting an ad-hoc approach to assessing the impacts and costs of the particular project being proposed. With the rapidly changing technology available in this field, many local waste managers do not have access to sufficient

*If only direct capital and operating costs were taken into account, landfilling would prevail singularly as the most economical and practical option for all of our waste disposal needs.*

information to accurately assess all of the cost implications that need to be taken into account when comparing alternatives and making decisions. Certainly, in most areas, if only direct capital and operating costs were taken into account, landfilling would prevail singularly as the most economical and practical option for all of our waste disposal needs. However, while this approach may have been acceptable a few decades ago, it is now generally recognized that the indirect costs — those associated with health risks, property value depreciation, environmental risks, lost opportunity and quality of life in the adjacent communities — must also be taken into account. While some of these costs may be difficult, if not impossible, to measure in a precise manner, they are real and must somehow be taken into account.

Alberta Environmental Protection has encouraged municipalities to collect basic data on waste management services that will aid them in decisions regarding various programs and projects. The Action on Waste division supports the implementation of the recommendations of *Our Forgotten Resource — The Common Sense Approach*.

*It is recommended...*

*3.5 that a system be established to assist waste managers in identifying the full costs of various alternatives and processes, in order to determine the optimum municipal and industrial investment approach.*

*The Environment Council of Alberta Task Force on Economic Instruments for Waste Reduction, September 1994*

Action on Waste recognizes that, for municipalities to be able to fully understand and compare the costs of various waste management alternatives, they need to have a common understanding of the true or full costs associated with the various options. It also acknowledges that there are virtually an unlimited number of factors that could be considered when referring to the "full costs" of a particular waste management project.

To address this need, Alberta Environmental Protection has adopted a common definition for *full cost analysis* applicable to waste management systems in the province, and has developed this structured user guide to assist municipal waste managers in implementing full cost analysis procedures.

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## **PURPOSE**

This user guide is intended to be a working reference document for municipal waste managers that will guide the orderly calculation of the full costs of a project in a uniform and consistent manner.

The resulting full costs established can be used for the comparison of alternatives...for decision-making purposes...for determining financial requirements...and for establishing recovery rates or user fees. When applied uniformly by all municipalities throughout Alberta, meaningful comparisons can be made between waste management projects in different municipal jurisdictions with the confidence that they are being made on a level playing field.

It is not the intention that this document will in any way relieve the user of the responsibility for making proper and creditable cost estimates based on the best information available at the time. It is important that this user guide and the underlying principles be thoroughly understood before the user attempts to apply it to a project. The full cost analysis concepts developed and recommended should not be applied out of context with the complete process, or the results can be very misleading. The temptation to shortcut the process should be resisted. Misunderstanding and misuse of the process may actually compound the problems that the full cost analysis process is attempting to resolve.

*The temptation to shortcut the process should be resisted.*

It is equally important that the political decision-makers acquire an understanding of the principles of the full cost analysis process, the meanings behind it and its limitations before making any decisions based on a full cost analysis summary report.

Users should also be careful not to confuse full costs with financial strategies when conducting the analysis. Quite simply, the costs are the actual expenditure of funds and the cost of impacts incurred that result directly from the project in question. Financial strategies are those mechanisms used to generate the funds required.

*Financial strategies are those mechanisms used to generate the funds required.*

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## LAYOUT

The *Full Cost Analysis Guide* has been laid out in four distinct sections.

### *What Is It?*

**The first section explains what full cost analysis is — and what it is not.** The importance and need for a common approach to full cost analysis is discussed. It also provides a definition of full cost analysis which has been adopted by Alberta Environmental Protection as the official definition for use in evaluating and comparing waste management projects and facilities in the province.

### *When and How To Use It*

**The second section describes when and how to use the guide.** It discusses the process of developing a project, from the initial concept through to commissioning, and describes how and when the various levels of full cost analysis should be introduced. The network stepmatrix analysis process for identifying impacts is introduced in this section, followed by the role of the Environmental and Health Impact Assessment (EHIA) for the identification and evaluation of non-monetary environmental, health and societal considerations. The differences between monetary costs and non-monetary considerations are explained, and the fallacies of assigning arbitrary or judgmental cost values that are not defensible are discussed. Finally, a description and explanation of the ranking system to be used for non-monetary considerations is provided, along with a discussion on the necessity for discounting monetary costs to reflect present value.

### *The Elements*

**The third section is a reference section that provides a series of checklists of factors and costs to be considered and/or included in the full cost analysis.** The concepts of risk are introduced, and appropriate mechanisms for incorporating the various types of risks are discussed. This section also provides comments on the cost components, explaining the intent and correct application of each group of factors.

### *Handy Worksheets*

**The fourth and final section is a series of work sheets that can be used to facilitate the compilation and summarization of monetary costs and non-monetary considerations to arrive at the full cost of any project.** These worksheets are intended to be used directly for the manual calculation of full costs, or as a guide to develop a customized, computerized set of worksheets using any standard spreadsheet program such as EXCEL or LOTUS 1-2-3.



### *FULL COST ANALYSIS...What Is It?*

Many of the cheapest and simplest methods of dealing with our wastes are already in place. Some of the solutions to our waste management problems carry an immense price tag when measured in monetary terms alone. However, these solutions are deemed necessary to address the environmental, health and social concerns that may have resulted from those cheaper methods or from the status quo. We don't have the resources to be able to deal with them all at once, so it is critical that we can effectively analyze and prioritize the alternatives and deliver the highest cost benefit. One thing all projects do have in common is that eventually someone has to pay for them — all of the costs, both monetary and non-monetary.

*One thing all projects do have in common is that eventually someone has to pay for them*

*Full cost* is a term that is used widely in our society. It is a term that most people believe they understand but, in reality, one that has no commonly accepted definition. It has a variety of different meanings for different people. Other similar terms are frequently used interchangeably with the term "full cost": *real cost, true cost, total cost, actual cost, full price.*

In order to establish an appropriate definition and scope for full cost analysis, it is important to have a clear understanding about what it is intended to do. Basically, the primary purpose of any economic analysis is to determine what course of action makes the most economic sense. A full cost analysis should be considered as an economic analysis that is expanded to include the environmental, health and social costs, both in monetary and non-monetary terms. Full cost analysis taken in this perspective would assign values to environmental, health and social considerations that may not be actually charged to any particular individual or group but are, nonetheless, very real. The release of greenhouse gases or the depletion of non-renewable resources are examples of non-monetary impacts that need to be taken into account when comparing waste treatment options.

*The primary purpose of any economic analysis is to determine what course of action makes the most economic sense.*

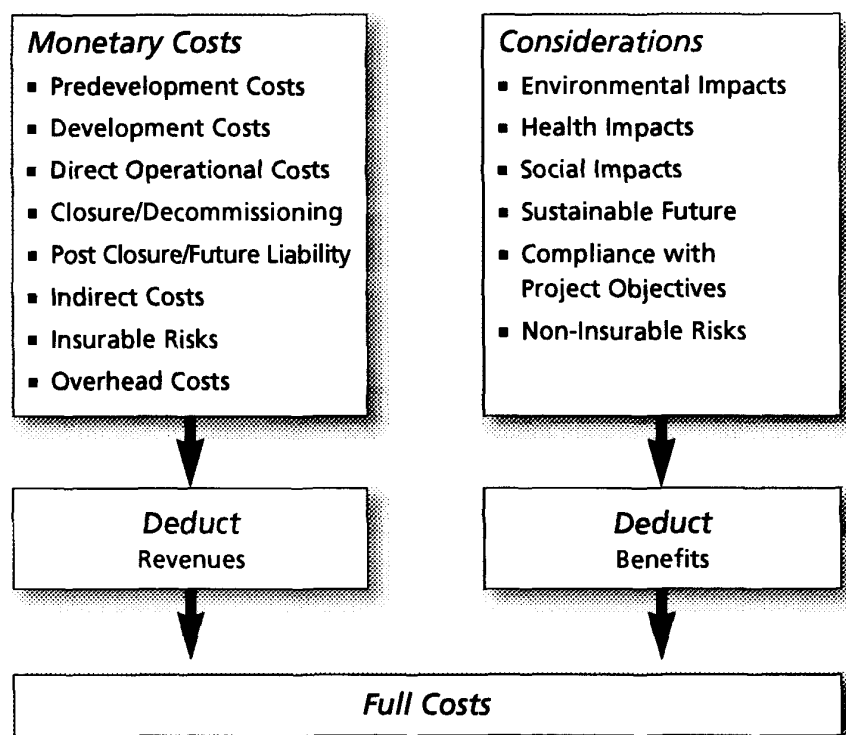
To address the need for a common approach to full cost analysis, Alberta Environmental Protection developed and adopted an official definition for full cost analysis as it relates to waste management projects in Alberta. The accompanying chart is intended to be incorporated as an integral part of the definition for purposes of clarification and to avoid ambiguity or misinterpretation.

**Figure 1**

## *Full Cost Analysis Definition*

Full cost analysis shall mean the total of all real, definable and measurable costs, both direct and indirect and from all sources, incurred or attributed to the particular project or system in question, when taken together with all additional considerations that are not measurable in monetary terms but may influence decisions or perceptions relating to the project or system.

For purposes of clarification, the following chart should be considered an integral part of the definition.



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## ***SOME POSSIBLE IMPACTS OF USING FULL COST ANALYSIS***

Full cost analysis is not a panacea for decision-making. While it offers some very distinct benefits and can be a valuable tool to assist in evaluation and decision-making processes, it must be used properly and within its limitations. Various impacts may result from the use of full cost analysis.

Full cost analysis:

- will introduce more rigor into the economics and financial management of a project;
- will offer the opportunity for true comparisons between different processes, such as recycling versus landfill;
- will offer the opportunity for true comparisons between new processes and the status quo/"do nothing" alternatives;
- can show the real cost relationships between various components of a project;
- will help protect the user against "blind side" challenges about the merits and impacts of a project;
- can help extinguish the myth of free waste disposal;
- can make "what if" scenario planning meaningful and practical;
- can expose high unit costs;
- may raise questions about cost/benefit claims previously justified on an empirical or ad hoc basis;
- may precipitate challenges of the value of avoided costs;
- may facilitate unfair comparisons if used improperly; and
- may lead to the elimination of some favorite projects, facilities and/or programs that are not cost effective or efficient.



### *FULL COST ANALYSIS...When and How to Use It*

Full cost analysis is a living process. To achieve maximum benefit, full cost analysis should not be considered as a snapshot in time, but rather as a dynamic process that moves with the project through time, and is upgraded to reflect new and better information when appropriate.

The development of any project will normally proceed in the following sequential phases:

- the conceptual evaluation phase;
- the preliminary design phase;
- the approvals phase;
- the final design phase; and
- the implementation phase.

At the end of each of these phases a full cost analysis should be undertaken.

*Full cost analysis is a dynamic process that moves with the project through time.*

Larger projects can be further divided into sub-phases. Additional phases could be added to projects such as a landfill, incinerator or materials recovery facility (MRF) where the operating life, combined with the closure and post closure responsibilities, extends over a long period of time. In these instances, the full cost analysis process should be applied or updated upon completion of each sub-phase as well.

For small projects, it may be expedient to combine some of the phases. For example, where the total expenditure of funds is small, a project could advance directly from the conceptual design phase to the final design phase.

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## **THE PHASES OF A PROJECT**

### **Conceptual Evaluation Phase**

*The objective is to improve on the status quo.*

Normally, any project begins with an idea or a defined need. The objective is to improve on the status quo. In the case of a waste management project, it may stem from legislated requirements; from the need to replace a landfill that is reaching capacity or to replace an outdated or obsolete facility; from public pressure to mitigate environmental, health or social problems; from a need to improve efficiency for economic reasons; or, in some instances, from a commitment to a particular ideology. At this stage, it is usually not possible to develop a meaningful estimate of the costs that will be incurred, although some rough estimates based on past experience are made to provide an indication of the magnitude of costs that can be expected.

From this idea or need flows a concept that ultimately becomes the project. Once the full concept of the project is established, the basic project objectives are set out, a tentative site is selected and a conceptual design is developed. If the project is an education program for waste reduction purposes or a new type of collection process, a site may not be an integral part of the project. A conceptual level of cost estimate can now be prepared, although it may not be possible to claim a very high order of accuracy at this early stage.

*By using full cost analysis the evaluation process becomes much more structured.*

From this information, the first level of full cost analysis can now be undertaken. The detailed process is described elsewhere in this section. Even without following a formal full cost analysis process, an evaluation of some form — usually ad hoc — is normally done, taking into account all known costs and impacts to determine if the project is considered viable and should proceed. By using full cost analysis at this stage, the evaluation process becomes much more structured. With the aid of a checklist, the scope of the evaluation becomes much more thorough. However, it must be recognized that there will still be considerable information gaps. While any decisions made at this point will benefit from the full cost analysis process if it is used, it is important to maintain the perspective that this is still a conceptual evaluation and that complete information is not available.

Upon completion of the conceptual evaluation phase, the following questions must be answered:

- Is the project viable?
- Is the project affordable?
- Does the project meet its initial objectives?
- Should the project proceed to the next phase?
- Does the project fit in with other priorities?

If the answer to all of these questions is “yes”, the project can advance to the preliminary design phase. If the answer to any of the questions is “no”, the concept must be reviewed and/or reconsidered. If it is determined that there is a fatal flaw inherent in the project, the entire project may be in jeopardy.

*If there is a fatal flaw, the entire project may be in jeopardy.*

For purposes of this user guide, fatal flaw has been defined:

***fatal flaw:*** a fault or characteristic that has been determined to be so serious that it cannot be made acceptable with any amount of engineering, mitigation or compensation.

If the fatal flaw results from a site specific problem, the chosen site will have to be abandoned and a new one selected. If the fatal flaw relates to characteristics that cannot be rectified by selecting a different site, the project may have to be aborted.

If it is determined that the problems are not serious enough to be designated as a fatal flaw, then modifications to the conceptual design may be required to make the project acceptable. The conceptual cost estimates and the full cost analysis will then be updated to reflect these modifications.

***Fatal flaw:*** A fault or characteristic that has been determined to be so serious that it cannot be made acceptable with any amount of engineering, mitigation or compensation.

**Network stepmatrix analysis:** A process for the methodical analysis of the cause and effect relationships resulting from waste management activities, documented through a series of five matrices making up a stepmatrix that produces a summarized list of questions, issues for further study, possible impacts and key concerns for any waste management activity.

## **Preliminary Design Phase**

Upon acceptance of the conceptual design, the project will move to the preliminary design phase. In this phase, the level of design detail will be advanced to provide layout details, preliminary grades, operating plans, and any other information considered pertinent to a clear description of the orderly development and operation of the proposed project. This would normally include all plans and supporting documentation necessary to obtain development approvals, including those under provincial waste management regulations, and land use redistricting if required. Cost estimates can now be updated to reflect the higher level of detail available from this preliminary design.

Upon completion of the preliminary design, it is necessary to undertake some form of impact screening and assessment process to determine the environmental, health and social impacts that may result. While an ad hoc approach to this process using a checklist and experience may be acceptable for a small project such as the development of a recycling depot, too much is left to chance if this approach is used for a more complex project such as the siting of a new landfill facility. To facilitate this impact screening and assessment process, the network stepmatrix analysis set out in *Waste Facility Impact Screening For Environmental Health Impact Assessment* is recommended. The document is available on request from Alberta Health.

For purposes of this user guide, network stepmatrix analysis has been defined:

***network stepmatrix analysis:*** a process for the methodical analysis of the cause and effect relationships resulting from waste management activities, documented through a series of five matrices making up a stepmatrix that produces a summarized list of questions, issues for further study, possible impacts and key concerns for any waste management activity.

Once the impact screening has been completed, the findings are incorporated into the terms of reference for an Environmental and Health Impact Assessment (EHIA) to be analyzed and quantified, and for appropriate recommendations to be made relating to mitigation.



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The findings of the network stepmatrix analysis and the results of the EHIA will now form the basis for a detailed evaluation of the non-monetary aspects of the full cost analysis. Any mitigation measures that have monetary cost estimates attached can be incorporated into an update of the project cost estimates. These, in turn, will be used to update the full cost analysis to the preliminary level.

The project is now at the second major decision stage. As at the end of the conceptual phase, these questions must again be answered:

- Is the project still viable?
- Is the project still affordable?
- Does the project still meet its initial objectives?
- Should the project proceed to the next phase?
- Does the project fit in with other priorities?

If the answer to all of these questions is "yes", the project can advance to the approvals phase. If the answer to any of the above questions is "no", the concept must be reviewed and/or reconsidered.

Again, a negative answer to any of the questions might reveal a *fatal flaw*, dictating either the abandonment of the site and a new one to be selected or, if the fatal flaw relates to characteristics that cannot be rectified by choosing a different site, aborting the project.

If it is determined that the problems are not serious enough to be designated as a fatal flaw, then modifications may be required to the preliminary design to make the project acceptable. This may require corresponding adjustments to the network stepmatrix analysis and to the EHIA. The preliminary cost estimates and the full cost analysis will then be updated to reflect these modifications.

*The findings of the network stepmatrix analysis and the results of the EHIA form the basis for a detailed evaluation of the non-monetary aspects.*

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## ***Approvals Phase***

Upon acceptance of the preliminary design and the corresponding full cost analysis, the project will advance to the approvals phase. Normally, the approvals required at this point would include:

- municipal land use redistricting under the provincial *Municipal Government Act*;
- a municipal development permit; and
- a permit to develop a waste management facility under provincial waste management regulations.

In special circumstances, other required approvals may include:

- a federal assessment under the Canada *Environmental Assessment Act*;
- a hearing before the Natural Resources Conservation Board; and
- other relevant municipal, provincial or federal legislation that may be applicable to the particular project.

All of these approval processes contain provisions for appeals through special appeal boards and ultimately through the courts.

*Either the project will be approved or it will not.*

At various stages in the approvals process, it may be necessary to further modify the preliminary design and adjust the impact analysis, the EHIA and the preliminary cost estimates accordingly.

The final outcome of each of the required approvals processes will ultimately have a favourable or an unfavourable result — either the project will be approved or it will not. If all of the approvals are granted, the project would normally advance directly to the final design phase. If approval is denied by any of the approving authorities, the reason for denial must be tested for a fatal flaw which would dictate either the abandonment of the site and the selection of a new one or, if the fatal flaw relates to characteristics that cannot be rectified by selecting a different site, the project may have to be aborted.

If it is determined that the reasons for denial of approval are not serious enough to be designated as a fatal flaw, then further modifications may be required to the preliminary design to make the project acceptable. This will require corresponding adjustments to the network stepmatrix analysis, the EHIA, the preliminary cost estimates, and the full cost analysis to reflect these modifications. The appropriate steps to acquire the necessary approvals would then be retraced.

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## ***Final Design Phase***

Upon obtaining the necessary approvals, the project can advance to the final design phase. The final design phase includes the preparation of all plans, specifications and procedures necessary to build and operate the particular facility. This will provide a much higher level of detail with which to update cost estimates and to assess the environmental, health and social impacts. The design and cost information will be used to update the network stepmatrix analysis and the EHIA. This, in turn, will be used to update the full cost analysis to the final design level.

At the end of the final design phase, the third stage in the decision process is reached. The same questions are asked:

- Is the project still viable?
- Is the project still affordable?
- Does the project still meet its initial objectives?
- Should the project proceed to the next phase?
- Does the project fit in with other priorities?

If the answer to all of these questions is “yes”, the project can advance to the implementation phase. If the answer to any of the above questions is “no”, the concept must be reviewed and/or reconsidered.

Again, a negative answer to any of the questions would require a test for a fatal flaw, dictating either the abandonment of the site and selection of a new one or, if the fatal flaw relates to characteristics that cannot be rectified by choosing a different site, aborting the project.

If it is determined that the problems are not serious enough to be designated as a fatal flaw, then modifications may be required to the detailed design to make the project acceptable. This will require corresponding adjustments to the network stepmatrix analysis and to the EHIA. The detailed cost estimates and the full cost analysis will then be updated to reflect these modifications.

*This will provide a much higher level of detail with which to update cost estimates and to assess the environmental, health and social impacts.*

## ***Implementation Phase***

*It is very rare for any project to be constructed in complete accordance with all of the design provisions.*

Upon acceptance of the detailed design and the corresponding full cost analysis, the project will advance to the implementation phase for construction and commissioning. It must be recognized that it is very rare for any project to be constructed in complete accordance with all of the design provisions. A variety of conditions can be encountered that will necessitate modification to the original design during construction. Upon completion of the project, the network stepmatrix analysis and the EHIA should be updated to reflect the "as built" conditions and the full cost analysis updated accordingly.

### ***Final full costs***

At this point, the full cost analysis can be considered "final", reflecting the true costs of the project in both monetary and non-monetary terms. The old expression "what you see is what you get" is probably quite descriptive at this stage.

*An up-to-date full cost analysis can serve as an excellent reference base for establishing user fees and reserve funds.*

It is recommended that the network stepmatrix analysis, the EHIA and the full cost analysis all be maintained as living, operating documents which are updated at regularly scheduled intervals throughout the operating life of the facility. These documents can become valuable checklists and benchmarks for future monitoring references, and for environmental and operating audits. As well, an up-to-date full cost analysis can serve as an excellent reference base for establishing user fees and for establishing closure, post closure and replacement reserve funds. However, due to inflation, technological change and other circumstances that cannot be foreseen, the future costs over the life of the project may still be radically altered from what was originally projected. Therefore, regular updates are imperative if these tools are to be of use for these purposes.

*Estimates will have to be defended.*

In all phases of the project development process, the need for sound estimates cannot be over emphasized. There will always be a time when estimates will have to be defended. If they cannot be defended, the credibility of the entire project and all personnel associated with it will be cast in doubt. Arbitrary or empirical costs cannot be defended and can distort the full costs of a project unintentionally. The end result would be unfair decisions being made on the basis of incorrect information. The reliability of the results of the full cost analysis will only be as good as the quality of the estimates used. Where is the expression "garbage in, garbage out" more appropriate than here?

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## **FULL COST ANALYSIS PROCESS**

Full cost analysis is a five-step process for the identification and categorization of all real, definable and measurable costs from all sources, coupled with any additional non-monetary considerations. The objective of the process is to facilitate sound decisions by providing a concise summary of both monetary and non-monetary costs attributed to a proposed project or system. Figure 2 on page 18 depicts the full cost analysis process graphically.

For purposes of full cost analysis, a new paradigm is necessary to distinguish between monetary and non-monetary costs. This new paradigm separates the measurable monetary costs into a category called “cost estimates” and the non-measurable costs or impacts into a non-monetary category called “considerations”. Only items that can be clearly and measurably defined in real monetary terms are included in the category of “cost estimates”. All other items and concerns are to be addressed as “considerations”. The end result of the new paradigm for full cost analysis will be a meaningful, composite representation of the full costs of a project in both monetary and non-monetary terms.

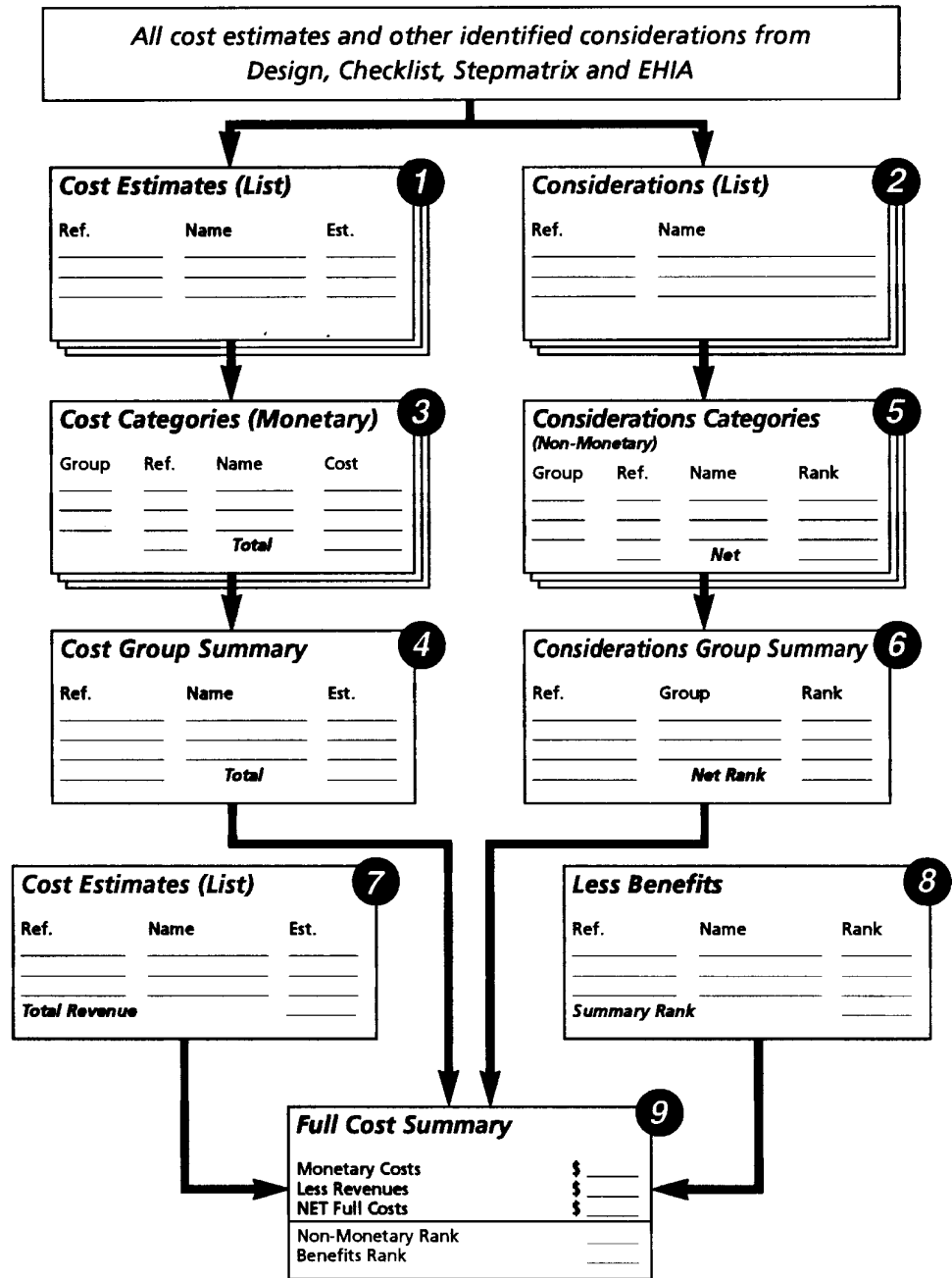
***New paradigm:*** a different way of looking at things.

The first step in the full cost analysis process is to consolidate all of the cost estimates and impacts onto a single set of summary sheets. Samples of these summary sheets are included in Section Four. Cost estimates will be brought to present value and carried forward in terms of current dollars. Considerations will be carried forward in descriptive terms and ranked according to their individual degree of concern. The last step in the full cost analysis process will bring the cost estimates and the considerations together in a final summarized form to arrive at the full cost of the project.

*Only items that can be clearly and measurably defined in real monetary terms are included.*

**Figure 2**

## Full Cost Analysis Process



## **COST ESTIMATES**

As previously noted, the need for sound estimates cannot be over emphasized. All estimates should be based on the very best information available at the time. While detailed information may be limited in the early stages, this will improve as the project progresses. It is not the intention of this user guide to direct the preparation of the cost estimates, but rather how to put them to best use in analyzing the costs for a project. There are many methods and formats for the preparation of estimates, all of which will produce the appropriate information required for a proper full cost analysis. These methods have one thing in common — all require good sources of accurate information as a starting point.

Estimates are developed from a variety of sources as outlined in *Figure 3 – Development of Cost Estimates* on the next page. The most reliable sources of financial information will usually come from within the municipal government's own accounting section. The information will be derived from the costs of current activities and previous projects. The most common difficulty experienced is in getting the information into the right format.

Municipal financial reporting is normally set up on a cash basis rather than an incurred cost basis making it difficult to match costs with outputs in real time. Usually this can only be done accurately after fiscal year-end, unless an incurred costing system is being maintained in parallel.

Activity-based accounting is necessary to provide the level of costing detail needed to prepare good estimates. Fortunately, most Alberta municipalities have either established or are in the process of establishing activity-based accounting systems. Those that have not should consider doing so. It is also important that there be a good mechanism in place for inter-activity charging for services and overheads. These accounting practices should be promoted, encouraged and supported by the engineering and technical users of the financial services.

Overheads are normally calculated and applied to all cost centres by the central accounting section. However, each municipality or waste management authority may handle overheads in a different manner. It is important to know and understand what is included in the overheads and how they are established and applied before incorporating them into the estimates to avoid duplication and/or omission of costs.

### **Step 1**

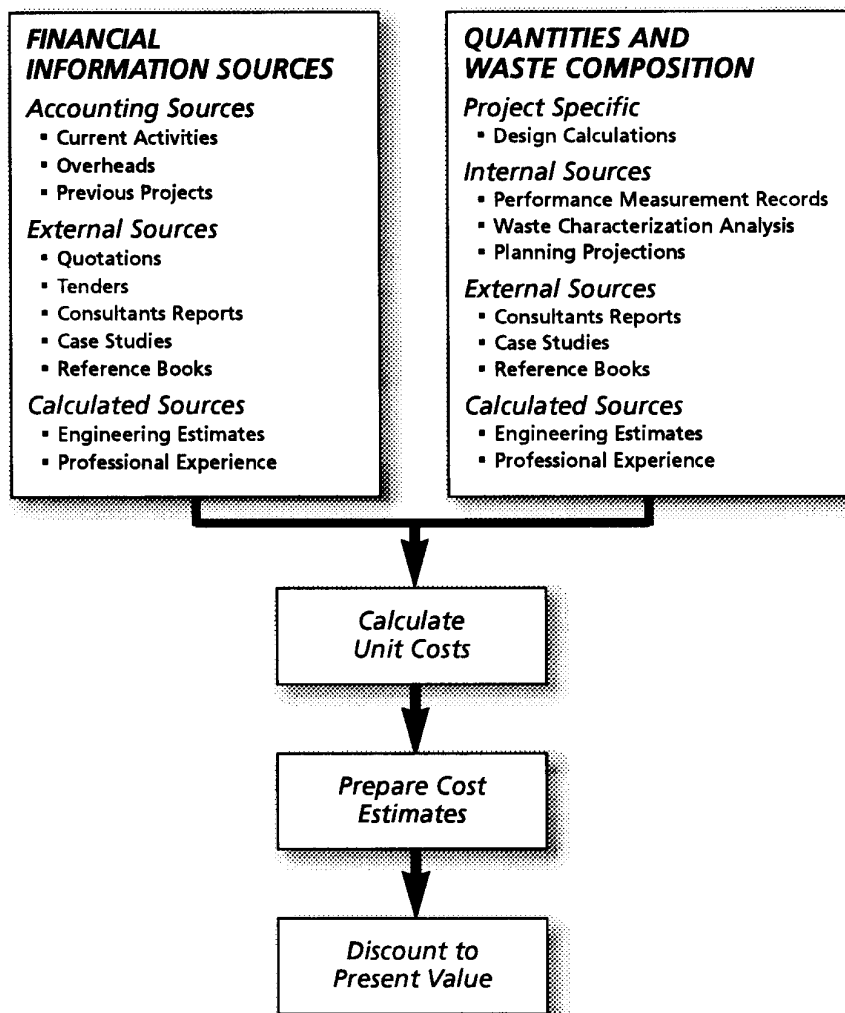
*All estimates should be based on the very best information available.*

*Activity-based accounting is necessary to prepare good estimates.*

*It is important to know and understand what is included in the overheads.*

**Figure 3**

## *Development of Cost Estimates*





One financial concern that will no doubt arise will be whether to apply shared costs on an incremental cost basis or on an allocated cost basis. There are many good arguments that can be put forward to justify either practice. The most convincing argument is the dilemma that arises when two projects sharing costs both attempt to claim incremental costs only. If the project is implemented, it is almost certain that shared costs will ultimately be assigned on an allocated cost basis. Therefore, it will be prudent to apply any shared costs, both overheads and inter-activity charges, on an allocated cost basis.

*Shared costs will ultimately be assigned on an allocated cost basis.*

The treatment of depreciation is another issue that will no doubt arise. However, for purposes of full cost analysis, depreciation should neither be considered as a cost nor as a source of revenue. Depreciation is simply a financial management strategy for purposes of amortizing the capital development costs over the life of the facility. Since capital costs are already included in the full cost analysis process, adding depreciation would result in a duplication of costs to the project. Similarly, any funds contributed to a replacement reserve fund are part of a financial strategy for the advance funding of a future facility, and are not to be included as costs in the full cost analysis process.

*Depreciation is simply a financial management strategy.*

It is important to recognize the need for good communication between the project staff and the accounting staff. Normally, if the accounting staff can understand what information is needed and the format that it is needed in, they will prove to be an excellent resource.

Project specific information may be acquired from external sources through quotations and tendered bids for equipment, materials and services. Once industry becomes aware of an impending project, there is usually no shortage of information that suppliers are eager to provide. However, caution must be exercised in interpreting quotations and in transferring them between projects. The suppliers of the goods and services may see the project from a totally different perspective and will provide quotations on the basis of their perceptions. Good channels of unimpeded communication directly between the estimator and the suppliers are important to obtain the best information. This may not always fit within corporate policy when there is a central purchasing authority with the responsibility for acquiring this information.

*Good channels of unimpeded communication are important.*

*Inter-municipal cooperation and information sharing can be invaluable.*

Other sources of information from external sources that may be used to assist in the preparation of estimates include:

- consultants' reports and studies for relevant work and for similar projects;
- case studies on similar projects in other jurisdictions;
- articles and papers in trade journals; and
- relevant reference text books.

In many instances, inter-municipal cooperation and information sharing can be invaluable and should be encouraged.

*Personal knowledge, judgment and professional experience will be required.*

Along with the financial information, certain supporting information will be required with respect to projections of design capacities, waste quantities, waste composition and participation rates. This information is normally the subject of a series of design calculations based on information from a variety of sources. Internal sources would include the performance measurement records for existing programs and services, operating records for existing facilities, a waste characterization analysis, and planning projections. Other external sources of information would include consultants' reports and studies, articles and papers in trade journals, reference text books, and inter-municipal cooperation.

Finally, there always comes a point where the personal knowledge, judgment and professional experience of the project staff will be required to prepare the estimates using a combination of the information acquired, a series of assumptions and engineering computations. It is important that documentation be maintained to support the basis for any assumptions made in this estimating process.

Through whatever individual estimating processes are used, this information should be transformed into unit costs and then consolidated into cost estimates for each aspect of the project. The checklists, starting on page 35, will aid the user in ensuring that all appropriate activities have been included in the estimate.

## Present Value

After the estimates have been completed and verified, they must be discounted to present value to make meaningful cost comparisons.

For purposes of this user guide, present value has been defined:

**present value:** the present value of money is the current value of a single future sum or series of future sums with consideration for the effects of time and interest.

The appropriate formulas and/or tables for the calculation of present value are included in most economics or financial management reference books. For convenience purposes, the three primary formulas for calculating present value are:

- Present value of a series of annual sums: 
$$P = \frac{A \times (1+i)^n - 1}{i(1+i)^n}$$
- Present value of a single future sum: 
$$P = \frac{F}{(1+i)^n}$$
- Present value of a perpetual series of annual sums: 
$$P = A/i$$

Where: F = Future value                      n = Number of years  
P = Present value                          i = Annual discount rate  
A = Annual cost or revenue

Transforming all cost estimates to present value and expressing them in terms of current dollars is the only way that a true portrayal of the full costs can be made on a uniform and consistent basis. However, this can create other problems in communicating cost information to political decision-makers and the public, as they will frequently need to know how much money has to be made available at any point in time.

Future costs will also be affected by inflation, technological change and other circumstances over the life of the project and must be recognized. Therefore, it is important to caveat the full cost information with a clear statement that the costs and revenues have been discounted to present value using accepted economic practices, and that they are always expressed in terms of present dollars. This must be clearly communicated when presenting a full cost analysis summary. In many instances, it may be necessary to prepare a parallel cost estimate summary using incurred cost estimates to demonstrate projected cash flow.

**Present value:** The present value of money is the current value of a single future sum or series of future sums with consideration for the effects of time and interest.

The selection of an appropriate discount rate for the calculation of present value requires careful consideration. One or two interest percentage points over a period of several years can make a significant difference in the resulting present value computed. It is recommended that the municipality's chief financial officer be consulted in establishing the appropriate discount rate, since this individual should have access to current forecasts and trends. It is further recommended that a sensitivity analysis be done to determine and demonstrate the effects that different interest rates, both higher and lower than the one selected, might have on the present values calculated.

[illegible]

## CONSIDERATIONS

As previously stated, it is a fallacy to try and assign arbitrary or empirical monetary values to an item that cannot be clearly measured. This is not to say that the particular factor does not have an associated cost. It only means that the factor is being described in terms of a ranking according to degree of concern rather than by a dollar figure. The indirect costs — such as those associated with health risks, property value depreciation, environmental risks, lost opportunity, and quality of life in the adjacent communities — that are not measurable in terms of dollars and cents are real, and can only be properly taken into account in this manner. Accordingly, these items are classified as “considerations”.

Considerations will be derived from a variety of sources and will include anything that could possibly be of any concern or have any impact on the project but cannot be defined in measurable monetary terms. The primary sources for identifying these considerations will be the network stepmatrix analysis and the EHIA.

In the first phase of the project when the conceptual evaluation is being undertaken, the user will not have the benefit of either of these sources. At that stage, the user will have to rely on checklists such as the ones starting on page 41, case studies on similar projects, consultants’ reports, research papers, articles and papers in trade journals, and relevant reference text books. Inter-municipal cooperation and information sharing should not be overlooked as an excellent source of current and relevant information. The professional experience of the project team and others with relevant knowledge from within or associated with the municipal organization should be utilized to best advantage in the early identification of considerations. Public opinions and statements of concern, media reports, and consultation with environmental activists and special interest groups can help to round out the list.

Any factor identified, regardless of how remote or insignificant it may seem at first, should be included. Its subsequent ranking will put it into the correct perspective, and its inclusion will demonstrate that it has been taken into account. If, upon completion of the full cost analysis, intervenors attempt to criticize the document, their cause will be weakened if it can be shown that their concerns were considered.

## Step 2

*The factor is ranked according to degree of concern rather than by a dollar figure.*

*Any factor, regardless of how remote or insignificant it may seem, should be included.*

Conversely, any relevant factors that are not included will tend to undermine the credibility of the project staff and the full cost analysis process used.

When all of the considerations have been defined and described in whatever format is convenient for the user, each item is to be assigned a reference number. The referencing system used can be any convenient system of the user's choosing, as long as it will facilitate the retrieval of the documentation of details. Again, the name used to describe the estimate should be a convenient and descriptive phrase that will be easily understood by others who might refer to the document in the future.

Finally, each consideration will be ranked according to the degree of concern in accordance with the following ranking system, and entered on the *Considerations Worksheet #2* on page 55.

**Figure 4**

## Considerations Ranking Factors

<b>RANK</b>	<b>DEGREE OF CONCERN</b>
1	Unfavourable
2	Marginally Acceptable
3	Acceptable
4	Very Favourable
5	Outstanding (justify)
FF	Fatal Flaw (justify)
NS	Not Significant (justify)
II	Insufficient Information Available

All considerations are ranked according to the degree of concern or seriousness on the scale of 1 to 5 — with 1 being an unfavorable situation causing major concerns, and 5 being an outstanding consideration worthy of high levels of praise and a model of excellence. In addition, the factors "FF", "NS" and "II" will be used where it is determined that the particular consideration warrants either a *fatal flaw* designation, a *not significant* designation, or where there is *insufficient information* available upon which to base a meaningful rank.

*It is recommended that all ranking be done by as large a group as practical.*

It is recommended that all ranking be done by as large a group as practical, preferably including community input through public forums and focus groups to ensure that the ranking fairly represents the views of society.

As defined, a fatal flaw will be considered as a fault or characteristic that has been determined to be so serious that it cannot be made acceptable with any amount of engineering, mitigation or compensation. A not significant designation will be used when a consideration is defined but is not considered to be of any real relevance or concern to the particular project. The insufficient information designation would indicate that more work needs to be done in subsequent phases of the project to establish a meaningful ranking factor. This designation would normally be used only at the conceptual phase of a project when limited detailed information is available.

Any time that either the not significant, fatal flaw or outstanding classification is used, it must be justified in the descriptive documentation, using examples or citing technical facts to support the designation.

The consideration ranking process is a subjective process and must be recognized as such. It represents the opinion of the user, the project team, or the collaborative view of a number of participants. This view can and will be challenged from time to time, and the user must be prepared to respond with the descriptive documentation to support the opinion. It will then be incumbent on the challenger to substantiate why the ranking is not appropriate and should be changed. Change may be appropriate in cases where information previously unknown to the user is introduced.

*Ranking of considerations can and will be challenged from time to time.*

### Step 3

## GROUPING AND SUMMARIZATION

Upon completion of the cost estimate and considerations listing worksheets, the full cost analysis process is a matter of progressively grouping and summarizing the documented information. This is accomplished by using a structured process to establish a single monetary number, and ranking for considerations and benefits. The structured summarization process is demonstrated schematically in *Figure 2 - Full Cost Analysis Process* on page 18.

Each item in the cost estimate list is assigned to one of a series of major categories, each with its own group name and reference number, and transferred to the *Cost Categories (Monetary) Worksheet #3* on page 57. The costs for each category are totalled and then entered on the *Cost Group Summary Worksheet #4* on page 59. Finally, the cost groups are totalled and transferred to the *Full Cost Summary Worksheet #9* on page 69 to be used in the final calculation of the "Net Full Cost". This leaves a clear documentation trail, as each item in each step of the summarization process is referenced back to its source on the previous sheet.

As an example of how these costs would be accumulated and summarized, a cost estimate for "site grading" listed on Worksheet #1 might be grouped with all other estimates pertaining to the development of a project and totalled under the group name "Development" on Worksheet #3. The development costs would be totalled with other group costs, such as "predevelopment" and "direct operations" on Worksheet #4, and subsequently transferred to the "Net Full Cost" category on the *Full Cost Summary Worksheet #9*.

Worksheet #3

Cost Categories (Monetary)

Project: \_\_\_\_\_ Sheet \_\_\_\_\_ of \_\_\_\_\_

Prepared by: \_\_\_\_\_ Date: \_\_\_\_\_

GROUP	REFERENCE	NAME	COST

Worksheet #4

Cost Group Summary

Project: \_\_\_\_\_ Sheet \_\_\_\_\_ of \_\_\_\_\_

Prepared by: \_\_\_\_\_ Date: \_\_\_\_\_

REFERENCE	NAME	COST

Worksheet #7

Cost Estimates

Project: \_\_\_\_\_ Sheet \_\_\_\_\_ of \_\_\_\_\_

Prepared by: \_\_\_\_\_ Date: \_\_\_\_\_

REFERENCE	NAME	COST

Worksheet #9

Full Cost Summary

Project: \_\_\_\_\_ Sheet \_\_\_\_\_ of \_\_\_\_\_

Prepared by: \_\_\_\_\_ Date: \_\_\_\_\_

MONETARY COSTS	From Worksheet #3



Similarly, the considerations list is categorized accordingly on the *Considerations Categories (Non-Monetary) Worksheet #5* on page 61. A "Net Rank" would be assigned to each of the consideration groups. This will not be a numerical averaging, but rather a subjective opinion by the user of the relative weighting of the individual ranking factors within the grouping.

Worksheet #5  
Considerations Categories (Non-Monetary)

Project: \_\_\_\_\_ Sheet \_\_\_\_\_ of \_\_\_\_\_  
Prepared by: \_\_\_\_\_ Date: \_\_\_\_\_

GROUP	REFERENCE	NAME	RANK

These groups with their respective rankings will be further summarized on the *Considerations Group Summary Worksheet #6* on page 63 where another "Net Rank" will be assigned, again based on the user's considered opinion of the relevance of each of the group net ranking factors. This "Net Rank" is then transferred to the *Full Cost Summary Worksheet #9* as the final "Non-Monetary Rank" of the full cost analysis process.

Worksheet #6  
Considerations Group Summary

Project: \_\_\_\_\_ Sheet \_\_\_\_\_ of \_\_\_\_\_  
Prepared by: \_\_\_\_\_ Date: \_\_\_\_\_

REFERENCE	GROUP	RANK

As with the cost estimate summarization, this grouping and summarization of considerations leaves a clear documentation trail, as each item in each step of the summarization process is referenced back to its source on the previous sheet.

Worksheet #9  
Full Cost Summary

Project: \_\_\_\_\_ Sheet \_\_\_\_\_ of \_\_\_\_\_  
Prepared by: \_\_\_\_\_ Date: \_\_\_\_\_

MONETARY COSTS (From Worksheet #4)	\$ _____
LAND ACQUISITION (From Worksheet #7)	\$ _____
NET FULL COST	\$ _____
NON-MONETARY RANK (From Worksheet #6)	_____
PROPERTY TAXES (From Worksheet #8)	_____
REMARKS	_____

Full Cost Summary Worksheet #9

## Step 4

*While not every project will show revenues, every project should provide some benefits.*

*Grants are not considered as a revenue but rather as a redistribution of wealth within society.*

### REVENUES AND BENEFITS

While not every project will show revenues, every project should provide some benefits. If there were not any benefits accruing from the project, there would not be any reason to proceed with it. Referring back to the Project Development Process, it was stated that any project begins with an idea or a need. The fulfillment of this initial idea or defined need is presumably one of the primary benefits.

Revenues may come from such sources as the sale of recyclable materials recovered at a new Materials Recycling Facility (MRF), from the sale of electrical energy generated by a new incinerator, or from the sale of bio-gas recovered from a landfill. Such items as diversion credits and cost savings to other waste management activities, while not truly revenues, should also be included as revenue equivalents because they do provide a measurable financial benefit.

User fees are not considered as revenue for purposes of full cost analysis, but rather as a source of funding to pay for a portion or all of the full costs of the project. Grants are not considered as a revenue but rather as a redistribution of wealth within society. Therefore, they should be considered as a funding source to pay for a portion of the costs of the project. However, access to grants from other levels of government may be considered as a project benefit with an appropriately assigned ranking.

Neither depreciation nor contributions to a replacement reserve fund are considered as revenues for full cost analysis purposes, nor are they considered as costs. These are financing strategies for amortizing or pre-funding capital development costs of either the existing or future facilities. The importance of these strategies for sound financial management purposes is recognized and is not in question. However, implied revenues from either of these sources is not included as part of the full cost analysis process.

Revenue estimates from all sources should be prepared using the best available information in the same manner as the cost estimates are prepared. These estimates must then be brought to present value expressed in terms of present dollars and entered on the *Revenues Worksheet #7* on page 65. Reference numbers and names are assigned in the same manner as for the cost estimates. The total of all projected

Worksheet #7

Revenues Worksheet

Project \_\_\_\_\_ Date \_\_\_\_\_ of \_\_\_\_\_

Prepared by: \_\_\_\_\_ Date \_\_\_\_\_

REVENUE	REVENUE SOURCE	ESTIMATE

revenues adjusted to present value is then transferred to the *Full Cost Summary Worksheet #9*, and deducted from the monetary costs previously entered to arrive at the "Net Full Cost" for the project.

Benefits may include or relate to almost any of the considerations listed, as well as to the response to the initial project objective. Environmental benefits may include items such as pollution abatement and odour reduction. Health benefits may include reductions in exposure to toxic or pathogenic materials or emissions; or, simply, a responsible approach to resolving the dilemma of acceptable waste disposal in an economical manner. Social benefits may include items relating to visual impacts, recreation value, and employment opportunities.

- *Environmental Benefits*
- *Health Benefits*
- *Social Benefits*

The sources for identifying and defining these benefits will be the same as those noted for defining considerations. Checklists, the network stepmatrix analysis, the EHIA, professional experience, and municipal cooperation and information sharing should all be used to establish a complete list of potential benefits. As well, case studies on similar projects, consultants' reports, research papers, articles and papers in trade journals, and relevant reference text books should be checked to ensure that none of the potential project benefits has been overlooked.

As in the case of identifying considerations, any factor identified, regardless of how remote or insignificant it may seem at first, should be included in this list of benefits. Its subsequent ranking will put it into the correct perspective, effectively demonstrating that it has been taken into account.

*Ranking will put a consideration into the correct perspective.*

When all of the potential benefits of the project have been defined and described in a format convenient to the user, each item will be assigned

Worksheet #8							
Benefits Summary				Action on Waste			
Project	Start	End	Prepared by	Date	Benefit	Description	Rank

a name or description and a reference number in the same manner as the considerations. This information will be transferred to the *Benefits Summary Worksheet #8* on page 67. Using the same ranking system applied to

considerations, a rank is assigned to each particular benefit defined. This, too, will be a subjective process reflecting the views of the user, the project team or the collaborative view of a number of participants.

A "Summary Rank" will then be assigned to the entire listing of benefits based on the user's considered opinion of the relevance and importance of the rank of each of the individual benefits. This "Summary Rank" will then be transferred to the *Full Cost Summary Worksheet #9*.

## Step 5

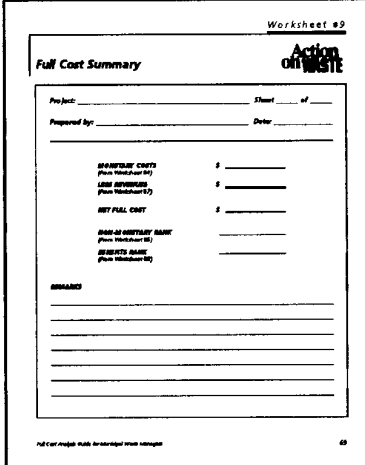
### COMPLETION OF THE PROCESS

The user may now add any comments or notes under the "remarks" heading on the *Full Cost Summary Worksheet #9* to draw attention to any particular observations, concerns, clarifications or caveats that may be appropriate.

Most importantly, this information can now be easily communicated to the decision makers and other stakeholders that have an interest in the project.

This *Full Cost Summary Worksheet* now sets out the full costs of the project in a simple, clear and concise format. The monetary costs shown represent the total of all real, definable and measurable costs for the project. By deducting the revenues that will accrue, the net full cost is set out in monetary terms. All additional considerations that are not measurable in monetary terms, but that may influence decisions or perceptions relating to the project, are represented by the non-monetary rank. All benefits that accrue from the project are represented by the benefits rank.

The full cost analysis process is now complete and the results can be incorporated into the project development process with the knowledge and satisfaction that all appropriate costs and considerations have been taken into account, using the best information available and to the best of the user's ability.



The image shows a worksheet titled "Full Cost Summary" with the "Action on Waste" logo in the top right corner. The form includes fields for "Project:", "Sheet \_\_\_\_ of \_\_\_\_", "Prepared by:", and "Date:". Below these are sections for "MONETARY COSTS (from Worksheet #6)", "LESS REVENUES (from Worksheet #7)", and "NET FULL COST", each followed by a line for a dollar amount. There are also fields for "RANK OF MONETARY RANK (from Worksheet #8)" and "BENEFITS RANK (from Worksheet #9)". A "REMARKS" section with several horizontal lines for text is at the bottom. The footer contains the text "Full Cost Analysis Guide for Municipal Waste Managers" and the page number "49".

### *FULL COST ANALYSIS...The Elements*

The end result of a full cost analysis is only as good as the elements within. This applies to the identification and compilation of all estimates and considerations which must be as thorough and accurate as available information will permit. Care must be taken to avoid both duplication and omission of any costs or considerations that might apply.

*Avoid any temptation to assign arbitrary or subjective costs to the components if they cannot be defended.*

Care must also be taken to avoid any temptation to assign arbitrary or subjective costs to the components if they cannot be defended. The pitfalls of doing so are twofold:

- if a cost cannot be explicitly defended in the face of scrutiny by reviewers and intervenors, the credibility of the analysis and the project team responsible will be put in jeopardy; and
- any inaccuracies in the component costs, either high or low, will distort the full cost analysis resulting in unfair decisions being made on the basis of incorrect information.

If assumptions must be made — and they will be — they must be clearly identified as such. It may be appropriate to append a list of those assumptions to the full cost analysis, particularly for the conceptual evaluation and preliminary design phases where the availability of accurate information may be limited.

Where it is not possible to assign a defensible cost to a particular item, resist the temptation to guess. Treat the item as a consideration.

### **RISKS**

Between the comfortable assumption of certainty and the unpleasant admission of uncertainty, all decision-making involves some recognition of risk. Whenever an "if" is included in a statement, a condition of risk is implied. Statements like "...chances are that..." indicate the recognition of risk and unconsciously assign a probability. Informally, risk is introduced into almost every decision process by way of doubts, second thoughts or a questioning attitude. Formally, risk assessment is a complex process of assigning values and probabilities to the possible consequences of a particular course of action.

*All decision-making involves some recognition of risk.*

A formal evaluation of risk is feasible when the likelihood of possible future outcomes for alternative courses of action can be assessed. This is not always possible. To a poker player, betting is very serious business.

*We must accept and manage the elements of risk.*

Decisions on when and how much to bet are made on the basis of the number and denominations of cards already played and the probability of remaining cards coming up. The probability of the next card being drawn can be calculated and the risk on the bet determined. A quick peek at the next card would be far more reliable and would be considered as perfect information. However, to most decision-makers, this kind of perfect information is rarely available as they are normally denied the opportunity for a quick peek into the future. Therefore, we must accept and manage the elements of risk properly and make the appropriate allowances in our decision-making processes. We must also take those allowances into account in the full cost analysis process.

*Nothing in this world is without risk.*

As an example of accounting for risk in the full cost analysis process, consider the risk of contamination of the groundwater with leachate from a landfill. Presume that all reasonable precautions have been taken in the siting and design to minimize this risk. However, regardless of how small it may be, there is still an acknowledged element of risk — nothing in this world is without risk. While there are established risk management analysis models that can be applied to calculate probabilities and consequential damages and to estimate remediation, the cost attached in the final analysis would be hypothetical at best. If, through this complex analysis process, a cost of \$3.0 million were assigned to this risk, its cost would be included in the full cost of the project. However, because the contamination may never occur, there would have been a serious distortion of the full cost. Nonetheless, important decisions on the project's future would be made on that basis.

In this example, the risk should have been identified as a consideration rather than a cost and assigned a ranking factor. The risk could still have been quantified through a risk analysis process. By treating it as a consideration with an appropriate ranking factor, it would have been taken into account in any subsequent decision-making processes without unnecessary distortion of the full costs.

It is not appropriate to handle all risks in this manner. Look, for example, at the risk of an ancillary building being destroyed by fire. This risk can be guarded against by purchasing insurance to cover loss if it should occur. In this case, the present value of the annual premiums for the insurance policy should be included as costs in the full cost analysis. No doubt, the risk analysis process has been used by the underwriter to assign a value, but the risk is now being carried by some other party, namely the insurer.

Therefore, for purposes of the full cost analysis process, insurable risks are to be included as costs, using the annual insurance premiums discounted to present value as the basis for the cost estimate. However, non-insurable risks, insurance deductibles and the risk of exceeding insurance coverage limits — because they are largely subjective — should be identified as considerations and ranked according to the degree of concern.

## **MONETARY COSTS CHECKLISTS**

While it is the responsibility of the user to undertake the preparation of estimates to reflect all of the components of a project — whether a landfill site, recycling depot or compost facility — that will at any point incur costs, the following checklists are provided as a guide. Cost components are listed under category names that can be used directly in preparing the worksheets to identify the various cost groups. These checklists should not be construed to be an exhaustive list of all cost factors and groups, but rather as a guide to assist users in compiling their own lists. Where appropriate, comments or clarifications should be added to clarify the scope and intent of the particular cost component or group.

*Costs should be reduced to present value and expressed in current dollars.*

### **Predevelopment Costs**

Predevelopment costs should include all costs incurred in the course of siting a facility and obtaining the necessary approvals for development. They should be reduced to present value from the time the costs are expected to be incurred, and expressed in terms of current dollars.

#### **Predevelopment Costs Checklist:**

- |  |   |
|--|---|
| <input type="checkbox"/> master plan preparation                 | <input type="checkbox"/> land use planning & re-districting |
| <input type="checkbox"/> reports to municipal council            | <input type="checkbox"/> public hearings                    |
| <input type="checkbox"/> site investigations                     | <input type="checkbox"/> appeals                            |
| <input type="checkbox"/> public consultation                     | <input type="checkbox"/> legal/court costs                  |
| <input type="checkbox"/> feasibility and pre-feasibility studies | — individual action   |
| <input type="checkbox"/> pre-design studies                      | — class action  |
| <input type="checkbox"/> EHIA studies                            | <input type="checkbox"/> intervenor funding                 |
| <input type="checkbox"/> regulatory applications                 | <input type="checkbox"/> purchase options                   |

### *Development Costs*

Development costs should include all costs incurred in the course of the development of the site. Many of these costs will be capitalized and amortized over a period of years. However, for purposes of full cost analysis, they are to be reduced to present value from the time the costs are expected to be incurred, and expressed in terms of current dollars.

#### *Development Costs Checklist:*

- |   |  |
|---|--|
| <input type="checkbox"/> land acquisition - site & buffer   | <input type="checkbox"/> facility buildings  |
| <input type="checkbox"/> expropriation                      | <input type="checkbox"/> laboratory facilities   |
| <input type="checkbox"/> compensation for relocation        | <input type="checkbox"/> fixed equipment   |
| <input type="checkbox"/> adjacent lands compensation        | <input type="checkbox"/> mobile equipment  |
| <input type="checkbox"/> property value protection plan     | <input type="checkbox"/> bins/containers   |
| <input type="checkbox"/> surveys                            | <input type="checkbox"/> complete first stage facility <ul style="list-style-type: none"><li><input type="checkbox"/> all appurtenances</li><li><input type="checkbox"/> subsidiary processing</li><li><input type="checkbox"/> ancillary facilities</li></ul>                                   |
| <input type="checkbox"/> land titles transfers and fees     | <input type="checkbox"/> liner systems   |
| <input type="checkbox"/> access route upgrading             | <input type="checkbox"/> leachate collection, treatment & disposal systems   |
| <input type="checkbox"/> utilities & pipeline relocation    | <input type="checkbox"/> surface water management systems  |
| <input type="checkbox"/> utility extensions and connections | <input type="checkbox"/> groundwater management & protection systems   |
| <input type="checkbox"/> detailed design                    | <input type="checkbox"/> signage   |
| <input type="checkbox"/> site grading                       | <input type="checkbox"/> environmental monitoring systems <ul style="list-style-type: none"><li><input type="checkbox"/> leachate</li><li><input type="checkbox"/> groundwater</li><li><input type="checkbox"/> surface water</li><li><input type="checkbox"/> air quality &amp; odour</li></ul> |
| <input type="checkbox"/> landscaping                        | <input type="checkbox"/> commissioning   |
| <input type="checkbox"/> on-site roads, utilities, parking  | <input type="checkbox"/> preparation of manuals and operating plans  |
| <input type="checkbox"/> scale facilities                   |  |
| <input type="checkbox"/> computer control systems           |  |
| <input type="checkbox"/> security systems                   |  |
| <input type="checkbox"/> administration facilities          |  |



### *Direct Operational Costs*

Direct operational costs should include all costs incurred in the course of the operation of the facility. For purposes of full cost analysis, these costs will normally be annualized then reduced to present value from the time the costs are expected to be incurred, and expressed in terms of current dollars.

#### *Direct Operational Costs Checklist:*

- |   |   |
|---|---|
| <input type="checkbox"/> labour & salaries                              | <input type="checkbox"/> litter control                                     |
| <input type="checkbox"/> management & administration                    | <input type="checkbox"/> environmental monitoring                           |
| <input type="checkbox"/> equipment                                      | — ground water  |
| <input type="checkbox"/> equipment rentals                              | — surface water   |
| <input type="checkbox"/> maintenance                                    | — leachate  |
| — access roads  | — air quality   |
| — utility connections   | — odour   |
| — site & grounds  | — ecologically sensitive areas, habitats or species                         |
| — mobile equipment  | <input type="checkbox"/> annual site development & closure (landfills only) |
| — fixed equipment   | <input type="checkbox"/> purchase of cover material                         |
| — buildings   | <input type="checkbox"/> staged expansion                                   |
| — ancillary facilities  | <input type="checkbox"/> enforcement of bylaws                              |
| <input type="checkbox"/> fuel/oil/tires                                 | <input type="checkbox"/> public participation programs                      |
| <input type="checkbox"/> utilities                                      | — public advisory committees  |
| <input type="checkbox"/> impact mitigation programs                     | — advertising/communications  |
| <input type="checkbox"/> contract services                              | — public education  |
| <input type="checkbox"/> site security                                  | — response to community concerns  |
| <input type="checkbox"/> leachate collection, treatment & disposal      | <input type="checkbox"/> hosting fees                                       |
| <input type="checkbox"/> surface water collection, treatment & disposal |   |
| <input type="checkbox"/> bird and animal control                        |   |

### *Closure & Decommissioning Costs*

Closure and decommissioning costs should include all costs incurred in the course of the closing and reclamation of the site. Many of these costs can be capitalized and amortized over a period of years. However, for purposes of full cost analysis, they should be reduced to present value from the time the costs are expected to be incurred, and expressed in terms of current dollars.

#### *Closure and Decommissioning Costs Checklist:*

- |  |  |
|--|--|
| <input type="checkbox"/> demolition & reclamation            | <input type="checkbox"/> installation of monitoring facilities |
| <input type="checkbox"/> capping & landscaping               | <input type="checkbox"/> leachate systems installation         |
| <input type="checkbox"/> utility disconnection & abandonment | — collection/treatment & disposal                              |
| <input type="checkbox"/> contamination remediation           | <input type="checkbox"/> gas recovery systems                  |

### *Postclosure and Future Liability Costs*

Postclosure and future liability costs include those relating to the monitoring, care and maintenance from the time the site is closed and reclaimed until it can be officially declared inert, and will require no more care or attention resulting from its use as a waste management facility. These costs will normally be annualized then reduced to present value from the time the costs are expected to be incurred, and expressed in terms of current dollars.

#### *Postclosure and Future Liability Costs Checklist:*

- |   |   |
|---|---|
| <input type="checkbox"/> administration                   | <input type="checkbox"/> environmental monitoring   |
| <input type="checkbox"/> site maintenance                 | — leachate  |
| <input type="checkbox"/> gas recovery operations          | — groundwater                                       |
| <input type="checkbox"/> leachate treatment & disposal    | — air quality & landfill gas                        |
| <input type="checkbox"/> surface water management         | — surface water                                     |
| <input type="checkbox"/> damage claims & liability        | — slope stability, subsidences & erosion            |
| <input type="checkbox"/> site security                    | — ecologically sensitive areas, habitats or species |
| <input type="checkbox"/> financial instruments/securities |   |

### *Indirect Costs*

Indirect costs may or may not be measurable in monetary terms. Where the user cannot estimate these costs with a reasonable degree of confidence, they should be treated as considerations instead. Where appropriate, a pro-rated allocation of shared costs can be computed and applied as accrued costs. All costs reported under this category will either be annualized or calculated as single cost items. They should be reduced to present value from the time the costs are expected to be incurred, and expressed in terms of current dollars.

#### *Indirect Costs Checklist:*

- |  |  |
|--|--|
| <input type="checkbox"/> opportunity costs | <input type="checkbox"/> recreation and tourism impacts                  |
| — tax revenue (gains/losses)               | <input type="checkbox"/> corporate management                            |
| — property value (gains/losses)            | <input type="checkbox"/> fire protection                                 |
| — site                                     | <input type="checkbox"/> police services                                 |
| — buffer                                   | <input type="checkbox"/> transportation and public service route changes |
| — haul routes                              | <input type="checkbox"/> transportation route maintenance                |
| — business opportunities (gains/losses)    |  |
| — development potential                    |  |

### *Insurable Risks*

Insurable risks include all risks for which insurance is normally available, regardless of whether the municipal corporation self-insures or insures through other sources. All costs associated with the annual insurance premiums or their equivalent should be included and reduced to present value from the time the costs are expected to be incurred, and expressed in terms of current dollars. Non-insurable risks should be identified as considerations and ranked according to the assessed degree of concern.

#### *Insurable Risks Checklist:*

- |   |   |
|---|---|
| <input type="checkbox"/> insurance premiums | <input type="checkbox"/> self-insurance |
| — general liability                         | — reserve contributions                 |
| — environmental impairment                  | — identified but unfunded               |
| — vehicles and equipment                    |   |
| — facility specific                         |   |

### *Overhead Costs*

Overhead costs would normally be calculated and applied as a part of the estimate for the particular activity or service to which it applies. Caution must be exercised to ensure that all appropriate overheads are properly allocated, and that there are no duplications or omissions. If there are any overheads that cannot be readily assigned to a particular activity or service, they can be included as a separate cost estimate item within one of the following categories or assigned as an indirect cost.

#### *Overhead Costs Checklist:*

- |  |  |
|--|--|
| <input type="checkbox"/> employee benefits                     | <input type="checkbox"/> management services                     |
| <input type="checkbox"/> GST & other taxes                     | <input type="checkbox"/> office space                            |
| <input type="checkbox"/> Workers' Compensation Board           | <input type="checkbox"/> office equipment, supplies and services |
| <input type="checkbox"/> interest charges on interim financing | <input type="checkbox"/> advertising and public relations        |
| <input type="checkbox"/> inter-program charges                 | <input type="checkbox"/> local transportation                    |

### *Other Costs*

The foregoing cost checklists are intended to include all cost items associated with activities referenced. If any of these costs have not been included under the previous headings, they should be identified and included in this category. Costs that are included in previous categories must not be duplicated in this category.

#### *Other Costs Checklist:*

- |  |  |
|--|--|
| <input type="checkbox"/> staff salaries    | <input type="checkbox"/> permit fees                   |
| <input type="checkbox"/> consulting fees   | <input type="checkbox"/> all applicable overhead costs |
| <input type="checkbox"/> contract services | <input type="checkbox"/> interim financing costs       |
| <input type="checkbox"/> testing           | <input type="checkbox"/> legal costs                   |
| <input type="checkbox"/> quality assurance | <input type="checkbox"/> public relations costs        |
| <input type="checkbox"/> materials         | <input type="checkbox"/> advertising                   |
| <input type="checkbox"/> equipment         | <input type="checkbox"/> public notices                |
| <input type="checkbox"/> supplies          | <input type="checkbox"/> public meetings               |

## CONSIDERATIONS CHECKLISTS

It is the responsibility of the user to undertake the identification and documentation of all considerations that may result directly or indirectly from a particular project. Considerations should be listed under category names that can be used to prepare the worksheets and identify the various considerations groups. These checklists should not be construed to be an exhaustive list of all possible consideration factors and groups, but rather as a guide to assist users in compiling their own lists. They are intended to include impacts that may be reasonably expected to result from the development and operation of any municipal waste management project. It may be necessary to supplement them to include any additional impacts or concerns specific to a particular project. Where appropriate, comments or clarifications should be added to describe the scope and intent of the particular cost component or group.

*Include all impacts which may result from municipal waste management projects.*

Some concerns will overlap between environmental, health and social impacts. Care must be taken to ensure that there are no duplications or omissions.

It should also be noted that certain legislation and principles adopted by the Alberta government will influence the identification and compilation of impacts. For example, matters relating to environmental protection and environmental health are governed by the statutes and regulations of various provincial departments. However, the primary legislation is the *Alberta Environmental Protection and Enhancement Act, 1993*. The Act consolidated eight other acts into a single piece of legislation and has, among its purposes, the following:

*(a) the protection of the environment is essential to the integrity of ecosystems and human health and to the well-being of society.*

In addition, in 1992 the Legislature unanimously adopted *Alberta's Vision of Sustainable Development* which states:

*Alberta, a member of the global community, is a leader in sustainable development, ensuring a healthy environment, a healthy economy, and a high quality of life in the present and the future.*

This vision has been adopted by more than 70 municipalities, and is contained in various forms in the mission statements of a number of government departments and private sector organizations and companies.

*Alberta Environmental Protection and Enhancement Act consolidates the following Acts and attendant regulations:*

- ♦ *Agricultural Chemicals Act;*
- ♦ *Beverage Container Act;*
- ♦ *Clean Air Act;*
- ♦ *Clean Water Act;*
- ♦ *Ground Water Development Act;*
- ♦ *Hazardous Chemicals Act;*
- ♦ *Land Conservation and Reclamation Act; and*
- ♦ *Litter Act.*

### *Environmental Impacts*

This checklist includes the majority of effects on the natural environment that can be anticipated as a result of siting a waste management facility. The list is not exhaustive and individual circumstances will dictate the inclusion of other impacts.

#### *Environmental Impacts Checklist:*

- |   |  |
|---|--|
| <input type="checkbox"/> loss of wildlife habitat                       | <input type="checkbox"/> disturbance of groundwater regime                     |
| <input type="checkbox"/> disturbance of wildlife                        | <input type="checkbox"/> disturbance of ecologically significant areas         |
| <input type="checkbox"/> loss of ecologically significant flora & fauna | <input type="checkbox"/> odours  |
| <input type="checkbox"/> attraction for non indigenous species          | <input type="checkbox"/> greenhouse gas emissions                              |
| <input type="checkbox"/> disruption to natural areas                    | <input type="checkbox"/> toxic gas emissions                                   |
| <input type="checkbox"/> disturbance of surface water regime            | <input type="checkbox"/> disturbance of archaeologically significant artifacts |
| <input type="checkbox"/> visual impacts                                 | <input type="checkbox"/> loss of use of agricultural lands                     |
| <input type="checkbox"/> noise  |  |

### *Health Impacts*

This checklist includes the possible effects on the health of humans and animals within the area of a waste management facility. Considerations should include individual and cumulative effects. Although it is recognized that some degree of scientific evidence is required to substantiate problems, perceived threats to health must also be taken into account.

#### *Health Impacts Checklist:*

- |  |  |
|--|--|
| <input type="checkbox"/> human health effects              | <input type="checkbox"/> mental & emotional stress                 |
| <input type="checkbox"/> surface water quality degradation | <input type="checkbox"/> vehicular traffic                         |
| <input type="checkbox"/> groundwater quality degradation   | __ public safety   |
| <input type="checkbox"/> air quality degradation           | __ dust  |
| __ release of pathogens                                    | __ litter  |
| __ release of toxic fumes                                  | __ exhaust fumes   |
| __ release of mold spores                                  | __ noise   |
| __ dust  | <input type="checkbox"/> carriers of disease                       |
| <input type="checkbox"/> noise                             | __ flies & other insects   |
| <input type="checkbox"/> livestock health & marketability  | __ rodents   |
|  | __ carrion birds   |
|  | <input type="checkbox"/> proximity to homes & food service outlets |

### *Social Impacts*

The evaluation of social impacts and concerns must be viewed from the perspective of the individual, the immediate community, and the greater public interest. It must take into account not only the impact but the numbers of individuals affected. It may be necessary to supplement this list to include impacts or concerns specific to a particular project.

#### *Social Impacts Checklist:*

- |  |  |
|--|--|
| <input type="checkbox"/> personal costs  | <input type="checkbox"/> recreation          |
| — public participation   | <input type="checkbox"/> land use changes    |
| — personal legal costs   | <input type="checkbox"/> NIMBY syndrome      |
| — private appeals  | <input type="checkbox"/> community character |
| — intervenor costs   | — noise                                      |
| <input type="checkbox"/> social & political discord  | — visual                                     |
| <input type="checkbox"/> proximity to schools,<br>hospitals, churches,<br>cemeteries and other major<br>community facilities | — odour                                      |
| <input type="checkbox"/> personal infringements  | — dust                                       |
| — expropriation of<br>property   | — public safety                              |
| — disruption of lifestyles   | — emotional                                  |
| — relocation of homes  | — trespass                                   |
| — property values  | — illegal dumping                            |
| — enjoyment of life and<br>property  | — vandalism                                  |
|  | — change of lifestyle                        |
|  | — changes of land use                        |
|  | — social stigma                              |
|  | — physical barriers                          |



### ***Sustainable Future***

This category should demonstrate any impacts that may be expected to impair ecosystem sustainability, or impinge on the overall objective of maintaining and achieving a sustainable future.

#### ***Sustainable Future Checklist:***

- |  |  |
|--|--|
| <input type="checkbox"/> depletion of non-renewable resources    | <input type="checkbox"/> cumulative effects of environmental health & social impacts |
| <input type="checkbox"/> greenhouse gas emissions/global warming | <input type="checkbox"/> incremental environmental impacts                           |
| <input type="checkbox"/> future land use limitations             |  |

### ***Compliance with Project Objectives***

This category of considerations should demonstrate how well the project will meet the original objectives set for the project at the time it was conceived. The checklist should be reviewed against the ideas or defined needs that were originally set out to improve the status quo.

#### ***Compliance Checklist:***

- |   |  |
|---|--|
| <input type="checkbox"/> effectiveness of waste program | <input type="checkbox"/> free from outside influences    |
| — economical  | <input type="checkbox"/> proven technology               |
| — efficient   | <input type="checkbox"/> integration with other programs |
| — practical   | <input type="checkbox"/> convenience                     |
| — meets community needs                                 | <input type="checkbox"/> project life expectancy         |
| — socially accepted                                     | <input type="checkbox"/> public perceptions              |
| — socially supported                                    |  |

### *Non-Insurable Risks*

The checklist for non-insurable risks includes any risk that may be reasonably expected to result from the development and operation of a municipal waste management project, but for which commercial insurance coverage is not normally available, or for which available insurance coverage limits are not considered adequate. It may be necessary to supplement this list to include impacts or concerns specific to a particular project. Use the risk assessment process to reasonably establish the degree of risk in order that an appropriate ranking factor can be applied.

#### *Non-Insurable Risks Checklist:*

- |   |   |
|---|---|
| <input type="checkbox"/> environmental protection systems failure | <input type="checkbox"/> fires and explosion  |
| — liner systems   | — consequential damage  |
| — surface water protection  | <input type="checkbox"/> bird/aircraft conflicts                                      |
| — groundwater protection  | <input type="checkbox"/> changes in waste composition                                 |
| — gas recovery systems  | <input type="checkbox"/> changes in waste volumes                                     |
| <input type="checkbox"/> technological obsolescence               | <input type="checkbox"/> facility failure to perform according to plans & regulations |
| <input type="checkbox"/> accidental substance releases            | <input type="checkbox"/> market fluctuations  |
| — chemical spills   | <input type="checkbox"/> insurance deductibles  |
| — illegal dumping   | <input type="checkbox"/> insurance adequacy   |
| — toxic fumes release   |   |

## ***REVENUES CHECKLIST***

Revenues can be derived from the marketing of byproducts from the particular waste process, or from the sale or salvage value of land, buildings and equipment made redundant by virtue of the project under consideration. In addition, some benefits of a project that materially reduce costs, such as diversion credits or reduced operating costs, can be considered as a revenue equivalent for full cost analysis purposes and should be included.

User fees are not considered as revenue for purposes of full cost analysis, but rather as a source of funding to pay for a portion or all of the costs of the project. Grants are not considered as revenue but rather as a redistribution of wealth within our society. Therefore, they should be considered as a funding source or financing strategy to pay for a portion of the costs of the project.

### ***Revenues Checklist:***

- |  |  |
|--|--|
| <input type="checkbox"/> marketing of byproducts | <input type="checkbox"/> salvage value       |
| <input type="checkbox"/> recyclables             | <input type="checkbox"/> land                |
| <input type="checkbox"/> compost                 | <input type="checkbox"/> equipment           |
| <input type="checkbox"/> landfill gas            | <input type="checkbox"/> buildings           |
| <input type="checkbox"/> electrical energy       | <input type="checkbox"/> revenue equivalents |
|  | <input type="checkbox"/> diversion credits   |
|  | <input type="checkbox"/> cost savings        |

## ***BENEFITS CHECKLISTS***

Benefits can include or relate to almost any of the considerations listed previously, as well as to the response to the initial project objective. Checklists, the network stepmatrix analysis, the EHIA, professional experience, and municipal cooperation and information-sharing should be used to establish a complete list of potential benefits. As well, case studies on similar projects, consultants' reports, research papers, articles and papers in trade journals, and relevant reference text books should be reviewed to ensure that none of the potential project benefits is overlooked.

### ***Project Benefits***

Environmental benefits can include items such as pollution abatement and odour reduction. Health benefits can include reductions in exposure to toxic or pathogenic materials or emissions. Social benefits can include items relating to visual impacts, recreation value and employment opportunities.

#### ***Project Benefits Checklist:***

- |   |  |
|---|--|
| <input type="checkbox"/> employment opportunities                           | <input type="checkbox"/> environmental enhancement |
| <input type="checkbox"/> compatible with other programs                     | — pollution abatement                              |
| <input type="checkbox"/> public examples                                    | — odour elimination                                |
| <input type="checkbox"/> beneficial use of by-products                      | — emission reductions                              |
| <input type="checkbox"/> local employment opportunities                     | <input type="checkbox"/> educational value         |
| <input type="checkbox"/> local business opportunities                       | <input type="checkbox"/> access to grant funding   |
| <input type="checkbox"/> development potential for complementary facilities | <input type="checkbox"/> social benefits           |
| <input type="checkbox"/> public health benefits & health risk reductions    | — enhanced property values                         |
| <input type="checkbox"/> reclamation benefits                               | — convenience                                      |
|   | — recreation opportunities                         |
|   | — enhanced safety                                  |

### ***Sustainable Future Benefits***

An underlying factor in waste management should be the achievement of sustainable development as articulated in one of the principles which guide decision-making in Alberta Environmental Protection:

*Albertans are dedicated to achieving sustainable development that ensures the utilization of resources and the environment today does not impair prospects for their use by future generations.*

This commitment should be reflected in the long-term benefits of the project.

#### ***Sustainable Future Benefits Checklist:***

- |   |   |
|---|---|
| <input type="checkbox"/> preservation of non-renewable resources  | <input type="checkbox"/> environmental preservation |
|   | — soil  |
| <input type="checkbox"/> highest order of materials use           | — groundwater                                       |
|   | — surface water                                     |
| <input type="checkbox"/> practical and beneficial end-use of site | — air   |
|   | — fuel emissions                                    |
| <input type="checkbox"/> reduction in greenhouse gases            |   |
| — site emissions  |   |



## *FULL COST ANALYSIS...Handy Worksheets*

To assist the user through the full cost analysis process on a step-by-step basis, a series of typical worksheets have been prepared and are included in the following pages. These worksheets will ensure a thorough evaluation of relevant results, and provide a tracking system to facilitate more detailed examination, and changes or updates to the supporting information.

*It is important develop a complete understanding of the concepts, complexities and limitations of the full cost analysis process.*

These worksheets can either be used for the manual analysis of the full costs of a project, or as a guide in setting up a customized, computerized set of worksheets using standard spreadsheet software such as LOTUS 1-2-3 or EXCEL.

It is important that the user first develop a complete understanding of the concepts, complexities and limitations of the full cost analysis process before attempting to apply the process with these worksheets. It is equally important that political decision-makers be afforded some understanding of the process, the meanings and its limitations before attempting to make decisions on the basis of full cost analysis.

The following sample worksheets, printed on one-side only to facilitate reproduction, are included:

<b>WORKSHEET NAME</b>	<b>PAGE #</b>
Cost Estimates Worksheet #1	53
Considerations Worksheet #2	55
Cost Categories (Monetary) Worksheet #3	57
Cost Group Summary Worksheet #4	59
Considerations Categories (Non-Monetary) Worksheet #5	61
Considerations Groups Summary Worksheet #6	63
Revenues Worksheet #7	65
Benefits Summary Worksheet #8	67
Full Cost Summary Worksheet #9	69









## Considerations

# Action on WASTE

**Project:** \_\_\_\_\_ **Sheet** \_\_\_\_\_ **of** \_\_\_\_\_

**Prepared by:** \_\_\_\_\_ **Date:** \_\_\_\_\_

[illegible]







### Cost Group Summary

# Action on WASTE

**Project:** \_\_\_\_\_ **Sheet** \_\_\_\_\_ **of** \_\_\_\_\_

**Prepared by:** \_\_\_\_\_ **Date:** \_\_\_\_\_

[illegible]





Considerations Categories (Non-Monetary)

Action  
onWASTE

Project: \_\_\_\_\_ Sheet \_\_\_\_\_ of \_\_\_\_\_

Prepared by: \_\_\_\_\_ Date: \_\_\_\_\_

GROUP	REFERENCE	NAME	RANK
_____	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	NET RANK











## Benefits Summary

# Action on WASTE

**Project:** \_\_\_\_\_ **Sheet** \_\_\_\_\_ **of** \_\_\_\_\_

**Prepared by:** \_\_\_\_\_ **Date:** \_\_\_\_\_

[illegible]





**Full Cost Summary****Action  
onWASTE**

Project: \_\_\_\_\_ Sheet \_\_\_\_\_ of \_\_\_\_\_

Prepared by: \_\_\_\_\_ Date: \_\_\_\_\_

**MONETARY COSTS**

(From Worksheet #4)

\$ \_\_\_\_\_

**LESS REVENUES**

(From Worksheet #7)

\$ \_\_\_\_\_

**NET FULL COST**

\$ \_\_\_\_\_

**NON-MONETARY RANK**

(From Worksheet #6)

\_\_\_\_\_

**BENEFITS RANK**

(From Worksheet #8)

\_\_\_\_\_

**REMARKS**


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